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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included. (AG)

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TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

Mounter, Color Film (Any ind.) 976.285
S-161

TM 001 563

U. S. Employment Service in
Cooperation with
New York State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
September 1959

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STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY
FOR
Mounter, Color Film (any ind.) 976.885-022

S-161

Summary

The General Aptitude Test Battery, B-1002A, was administered to a sample of 50 women employed as Color Film Mounters at the Dynacolor Corporation, a photographic-film processing firm, in Brockport, New York. The criterion consisted of rank comparison supervisory ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes G-Intelligence, P-Form Perception, F-Finger Dexterity, and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Mounter, Color Film (any ind.) 976.885

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Mounter, Color Film 976.885

TABLE I
Minimum Acceptable Scores on B-1001 and B-1002 for S-161

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1-H CB-1-I CB-1-J	80	G	Part 3 Part 4 Part 6	75
P	CB-1-A CB-1-L	70	P	Part 5 Part 7	70
F	CB-1-O CB-1-P	80	F	Part 11 Part 12	75
M	CB-1-M CB-1-N	80	M	Part 9 Part 10	80

Effectiveness of Norms

The data in Table IV indicate that 10 of the 17 poor workers, or 59 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 59 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 29 of the 36 workers who made qualifying test scores, or 81 percent, were good workers.

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TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of *Mounter, Color Film (any ind.) 976.885*

II. Sample

The GATB, B-1002A, was administered in August 1958, to a sample of 55 women employed as Mounting Operator 9-86.53 at the Dyncolor Corporation, Brockport, New York. The Dyncolor Corporation is a photographic-film processing establishment. The tested sample included the entire eligible pool of workers in this occupation at the plant.

A conference with the plant superintendent and personnel manager, and a study of the job, resulted in establishing two months as the minimum training period. Of the 55 women tested, five were eliminated from the sample: four because of incomplete test data and one because of insufficient experience. Therefore, the final sample consisted of 50 women.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations with the criterion for age, education, and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

Mounter, Color Film (any ind.) 976.885

N = 50

	M	σ	Range	r
Age (years)	31.6	11.5	17-52	.194
Education (years)	10.0	1.9	6-14	.232
Experience (months)	16.1	8.3	2-40	.182

There are no significant correlations with the criterion for age, education, or experience. The data in Table II indicate that this sample is suitable for test development purposes with respect to age, education, and experience.

III. Job Description

Job Title: *Mounter, Color Film (any ind.) 976.885*

Job Summary: Mounts color-film transparencies in cardboard slide frames by cutting off each transparency with a semi-automatic film-cutting machine, inserting it manually in a frame, and sealing to in place with a heat-sealing press. Keeps transparencies in sets by means of control numbers and keeps sets matched with customer's identification by twin-check numbers.

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Work Performed: Preparation: Sits at work table wearing white cotton gloves. Receives reel of film (15-25 film strips of 20 or 36 exposures each, spliced with adhesive tape), color card (record of the particular strips of film processed), and packet of ID tickets (1½ x 3 inch cards giving customer's account number, date, and twin-check number). Stamps own identification numbers on back of each ID ticket and stands them upright in tray on table. Puts reel on spindle, engages and threads film into track of cutter advancing film with hand feed knob. Cuts off film-strip's twin-check number by pressing switch lever. Matches number with corresponding ID ticket. Aligns cutting blade of cutting machine with frame-separating line between transparencies to set machine for first cut. Turns knob on counter on heat-sealing press to set it at zero. Places box of empty slide-frames in lap.

Mounting: Picks up empty slide-frame with left hand and simultaneously trips film cut-off switch with third and fourth fingers of right hand, and takes cut film from machine with thumb and first and second fingers. Inserts film in center fold of mount, closes fold, and inserts mount into slot of heat press, tripping extended handle of electric switch. Continues movement of one hand and arm to cut and take next film from cutter and to pick up empty slide-frame as before with other hand. Coordinates finger, hand, and arm motions.

Occasionally turns feed knob as needed to adjust alignment of frame-separating line and cutter blade. Observes film as it moves along track to detect double exposures, blank or black film; cuts off blank or black film and places with order without mounting.

When individual strip has been completed, removes the mounts from tray on sealer and places them with their ID ticket in a tray attached to adjacent conveyor belt. Records production accurately on tally sheet, sets counter to zero, mounts next film strip, and continues until entire reel is finished.

IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criterion consisted of rank-comparison supervisory ratings, corrected for experience. The first line and second line supervisors each made a set of ratings for workers under their supervision by using the rank-comparison method. The ratings were converted to linear scores and an average of the two sets was computed for use as a tentative criterion. A significant correlation was obtained between experience and this criterion. However, it was found that this relationship leveled off at the point where each member had had six months training. Therefore, using this new base, the criterion was corrected for the relationship with experience and an adjustment for each score was made to yield a corrected criterion score. The corrected criterion was used as the final criterion for this study.

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VI. Statistical and Qualitative Analyses

A. Statistical Analysis:

Table III shows the means, standard deviations, and Pearson product-moment correlations with the criterion for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Mounter, Color Film (any ind.) 976.885

N = 50

Aptitudes	M	σ	r
G-Intelligence	89.5	14.1	.415**
V-Verbal Aptitude	90.9	14.3	.357*
N-Numerical Aptitude	91.0	15.9	.383**
S-Spatial Aptitude	89.9	17.2	.167
P-Form Perception	93.0	17.9	.299*
Q-Clerical Perception	100.8	17.6	.451**
K-Motor Coordination	104.8#	14.6	.232
F-Finger Dexterity	102.6#	21.6	.433**
M-Manual Dexterity	103.6#	17.8	.268

** Significant at the .01 level.
* Significant at the .05 level.
# Relatively high mean.

The highest mean scores in descending order of magnitude were obtained for Aptitudes K, M, and F, respectively. All the aptitudes, except Aptitude F, have standard deviations of lessthan 20. Aptitude G has the lowest standard deviation.

For a sample of 50 cases, correlations of .361 and .279 are significant at the .01 level and the .05 level of confidence, respectively. Aptitudes G, N, Q, and F correlate significantly with the criterion at the .01 level. Aptitudes V and P correlate significantly with the criterion at the .05 level.

B. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation.

Form Perception (P) - required to align cutting blade of cutting machine, to detect double exposures, blank or black film, and other inspection duties.

Clerical Perception (Q) - required to keep transparencies in sets by means of control numbers, and to check identification numbers on film strips and identification tickets.

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Motor Coordination (K) - required to rapidly insert film into outer fold of mount, and to put reel on spindle and thread film into track cutter.

Finger Dexterity (F) and Manual Dexterity (M) - required in all mounting operations.

C. Selection of Test Norms:

Based on the quantitative and qualitative evidence cited above, Aptitudes G, P, Q, K, F, and M warranted further consideration for inclusion in the test norms. The evidence for each of these aptitudes is indicated below.

Aptitude	Relatively High Mean Score	Significant Correlation with the Criterion	Importance Indicated by Qualitative Analysis
G		X	
P		X	X
Q		X	X
K	X		X
F	X	X	X
M	X		X

Aptitude G was given further consideration for inclusion in the norms because it had a significant correlation with the criterion at the .01 level and was not considered irrelevant on the basis of the qualitative analysis. Although Aptitudes V and N had significant correlations with the criterion at the .05 level and the .01 level, respectively, these aptitudes were excluded from further consideration on the basis of the qualitative analysis.

Various combinations of Aptitudes G, P, Q, K, F, and M, with appropriate cutting scores were selected as trial norms. The relationship between each set of trial norms and the criterion (dichotomized as indicated in section VII) was determined.

A comparison of the results showed that B-1002 norms consisting of G-75, P-70, F-75, and M-80 had the best selective efficiency.

In test development studies an attempt is made to develop a set of norms such that the cutting score for each aptitude included in the norms will be set at a five-point score level close to one standard deviation below the aptitude mean of the experimental sample. Adjustments of cutting scores from one standard deviation below the mean are made to effect better selective efficiency of the norms. In this study the aptitude cutting scores are each within six points of one standard deviation below the aptitude mean of the sample.

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VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized by placing approximately one-third of the sample in the low criterion group. This was accomplished by setting a criterion critical score of 38 which resulted in 17 of the 50 workers, or 34 percent of the sample, being placed in the low criterion group.

Table IV shows the relationship between test norms consisting of Aptitudes G, P, F, and M with critical scores of 75, 70, 75, and 80, respectively, and the dichotomized criterion for Mounter, Color Film. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes G, P, F, and M with Critical Scores of 75, 70, 75, and 80, Respectively, and the Criterion for Mounter, Color Film (any ind.) 976.885

N = 50

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	4	29	33
Poor Workers	10	7	17
Total	14	36	50

$r_{tet} = .74$ $\quad X^2 = 9.933$

$\sigma_{r_{tet}} = .24$ $\quad P/2 < .005$

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes G, P, F, and M with minimum scores of 75, 70, 75, and 80, respectively, are recommended as B-1002 norms for the occupation of Mounter, Color Film. The Equivalent B-1001 norms consist of G-80, P-70, F-80, and M-80.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include four aptitudes, only those occupational aptitude patterns which include three of those four aptitudes with cutting scores that are within 10 points of the cutting scores

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established for the specific worker are considered for that occupation. Two of the existing 23 occupational aptitude patterns meet these criteria for this study. These occupational aptitude patterns and their B-1002 norms are OAP-10, G-75, F-75, M-80 and OAP-16, P-75, F-80, M-80. The selective efficiency of each of these OAP's for this sample was determined by means of the tetrachoric correlation technique. The same significant relationship of .69 was obtained between between OAP-10, OAP-16, and the dichotomized criterion. OAP-10 and OAP-16 screened out the same proportion of the sample (.26) which is within the required range of .10 to .60. However, the tasks for this occupation appeared to be more like those of occupations included in OAP-16. Therefore, OAP-16 is recommended for use in counseling for the occupation of

Mounter, Color Film (any ind.) 976.885,